Safety Topic – Liquid Nitrogen

- Cold: 77 K (−196 °C; −321 °F)
  - Explosion: gas expansion ratio is 1:694
    - A tremendous amount of force can be generated if liquid nitrogen is rapidly vaporized

- Asphyxiant
  - Dangerous because it is odorless, colorless and tasteless - no abnormal sensation
  - Causes about 8 deaths per year in the US
  - Unconsciousness/death can occur within 1 minute
  - Extremely dangerous when LN₂ spilled in an enclosed environment like a basement or elevator

- Condense oxygen from the air
  - The liquid in such a vessel becomes increasingly enriched in oxygen (boiling point = 90 K) as the nitrogen evaporates
  - Can cause violent oxidation of organic material

- Preventions and treatments
  - Dry and empty hands or loose-fitting thermal insulated or leather gloves
  - Do not store in a confined space without pressure relief devices
  - Safety glasses or even a full face shield
  - Symptoms: dizziness, nausea, vomiting
  - Don’t work alone

<table>
<thead>
<tr>
<th>Degree</th>
<th>Thickness</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Superficial</td>
<td>minor pain, lack of blisters</td>
</tr>
<tr>
<td>Second</td>
<td>Partial thickness – superficial</td>
<td>Blisters, clear fluid, and pain</td>
</tr>
<tr>
<td>Third</td>
<td>Partial thickness – deep</td>
<td>Whiter appearance</td>
</tr>
<tr>
<td>Fourth</td>
<td>Full thickness</td>
<td>requires grafts</td>
</tr>
<tr>
<td>Fifth</td>
<td>Subdermal</td>
<td>Hard, leather-like eschar, purple fluid, no sensation</td>
</tr>
</tbody>
</table>